POLICY facts

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Strategic Center for Natural Gas

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INFRASTRUCTURE REQUIREMENTS FOR THE APPLICATION OF DISTRIBUTED GENERATION TECHNOLOGIES

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Description

As demand for electricity grows and regulatory reforms continue in the gas and electric industries, the attractiveness of distributed generation (DG) as an alternative and supplement to traditional central power stations is expected to grow. As DG installations multiply, it is important to make sure that they do not strain the natural gas delivery system. The anticipated increases in natural gas demand for DG applications will require expanding, modifying and fortifying distribution mains across much of the U.S.

Background

To support 764 MW of additional electric generating capacity that was added in 2000 and the 1,200 GW projection for 2020 (ref. NETL 30 Tcf Study), natural gas is expected to be the dominant fuel of choice in these new electric generating power plants accounting for 66 percent of capacity. The Energy Information Administration (EIA's) Annual Energy Outlook 2002 predicts that about 19 GW of mostly gas-fired DG capacity (up to 50 MW in size) will be added by 2020 and all consuming sectors are expected to experience DG demand growth.

DG applications are considered to be significant near-term markets for the fuel cell, engine, and gas turbine products being developed by the Strategic Center for Natural Gas (SCNG). SCNG commissioned this study to seek a better understanding of the potential of continued DG market growth and the requirements this growth can place on the gas distribution system across the U.S. The study investigated infrastructure requirements for supplying natural gas for anticipated DG installations through 2020 under three different levels of penetration that ranged from conservative to optimistic estimates of DG market size. DG applications and their fuel requirements on an annual, peak-day and peak-hour basis were evaluated. Potential cost implications for LDC s with different classifications (urban, suburban and rural) and capacity conditions (excess, balanced, tight and very tight) were evaluated and the most economic solutions from several alternatives were identified.

RELATED SCNG REPORTS

- Natural Gas Infrastructure Requirements for the Application of Distributed Generation Technologies

- Supplying Natural Gas for Peaking in a 30+ Tcf Market

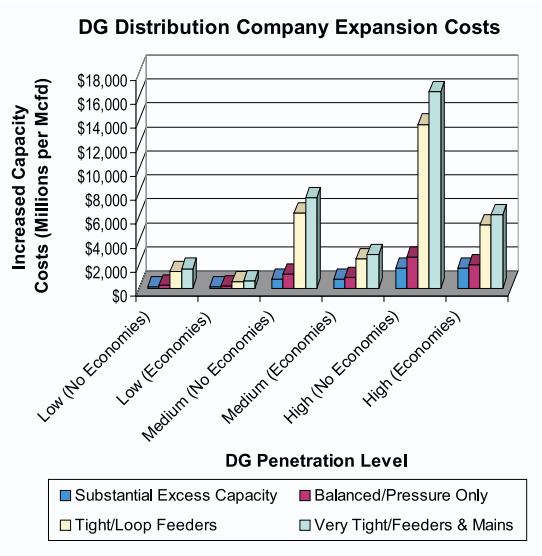

Figure 1

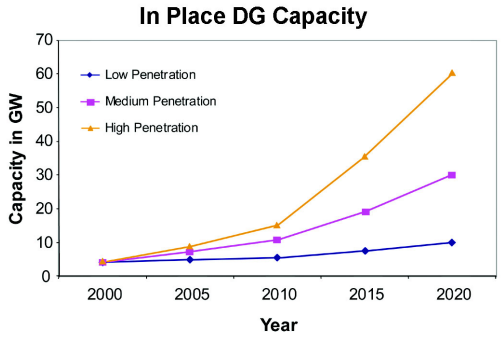

Figure 2

INFRASTRUCTURE REQUIREMENTS FOR THE APPLICATION OF DISTRIBUTED GENERATION TECHNOLOGIES

Conclusions

Higher DG penetration will change the total volume of gas consumed and move gas consumption from central station power plants – largely served directly off an interstate pipeline – to distributed resources that will mostly be served by gas distribution companies. The net volume impacts of DG on total gas consumption will depend on the efficiency of DG technologies and the market share for natural gas for power generation. It is very likely that significant growth in gas use for DG will increase loads on gas distribution systems. Since some portion of the new DG load will occur on peak days and peak hours, this will accelerate the need for general LDC infrastructure expansion to accommodate higher system peaks. Also, additional LDC investment will be needed to upgrade the capacity of the individual service lines, meters, and service regulators of the new DG customers (Figure 1). Since gas used for DG will likely substitute gas used by central power plants, it is likely that total U.S. pipeline and storage capacity requirements will not be affected much by high penetration rates of DG. However, the location of storage capacity needs could change.

Specific Findings

- Gas DG capacity could reach 10 GW by 2020 in the low penetration scenario and 60 GW in the high penetration scenario (Figure 2). The industrial sector will have the largest initial and final DG capacity. The residential DG capacity grows more rapidly in the high penetration scenario.
- DG impact on natural gas infrastructure will depend on the degree of urbanization of the LDCs.
- Up to $16 billion in LDC investments will be needed for additional DG loads. This figure corresponds to a situation where DG loads appear quickly and modifications are made specifically to accommodate the new DG loads (i.e., there are no economies of scale) in an already tight distribution system with high penetration levels.
- More likely, new DG loads will appear slowly and infrastructure expansions will coincide with other LDC expansions (i.e., there are economies of scale). In this case, costs could vary from $174 million per million cubic feet per day (Mcfd) in the low penetration, excess LDC capacity scenario to $6 billion per Mcfd in the high penetration, tight distribution system scenario.
- DG market size will depend very much on the regulatory environment under which LDCs operate and will vary from state to state. Cost competitive DG technologies, such as SECA fuel cells, and regulatory issues, such as interconnection and DG classification for rate structures, will influence DG success.